Vegetation Resources Inventory Change Measurement: Preliminary Field Procedures

Prepared by

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for the
Resources Inventory Committee

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Preface

Members of the Resources Inventory Committee (RIC) are resource specialists from a number of professional disciplines. They represent Provincial, Federal, First Nations, and private sector agencies and other resource interests. RIC's objectives are to develop a common set of standards and procedures for provincial resource inventories, as recommended by the Forest Resources Commission in its report *The Future of our Forests*.

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For further information about RIC and its various Task Forces, please visit the RIC website at http://www.for.gov.bc.ca/ric

Abstract

This document describes preliminary field procedures to measure changes in tree and non-tree vegetation resources. These procedures will be finalized following a pilot project in 2000. The field procedures are based on the Vegetation Resources Inventory (VRI) system of sampling methods, procedures, and standards. They may be applied at the provincial or the management unit level (e.g. Timber Supply Area [TSA]).

This document is used in conjunction with the current VRI ground sampling manual (version 4.0). It references the manual and identifies required additions to the present VRI system. The principal additions include: plots straddling polygon boundaries; mapping polygon boundaries; "hidden" plot locations; no destructive sampling in the plots; and the addition of a fixed-area plot for measuring large trees (4.0cm+). These additions are highlighted in the text.

Acknowledgments

We thank Del Meidinger and Chuck Bulmer (Ministry of Forests Research Branch) for advice on soil change measurement. We also thank Dave Campbell (MOF Resources Inventory Branch), Mathew Fairbarns (MOF Forest Practices Branch), and Dave Clark (Ministry of Environment, Lands and Parks) for advice on range resources biomass re-measurement.

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1.0 Introduction

1.1 Background

This document describes preliminary field procedures to measure changes in tree and non-tree vegetation resources. These field procedures are based on the Vegetation Resources Inventory (VRI) system of sampling methods, procedures and standards and will be field-tested in 2000.

Change is defined in this document as the difference in the amount or classification of the resource in an inventory unit between two or more points in time. At the provincial level, the preliminary field procedures will provide change data for:

- National reporting of the Criteria and Indicators (C&I) of sustainable forest management, and to meet other national Forest Inventory (NFI) goals (Canadian Forest Service, CFS),
- Provincial reporting of vegetation resources status and change (Ministry of Forests Annual Report).

These field procedures may also be applied at the management unit level(e.g. Timber Supply Area, or TSA) level, with modifications depending on the specific management unit objectives. At the management unit level, the change data may be needed to:

- Track changes in vegetation resources over time for certification and other purposes.
- Monitor (check) management unit change projections obtained from models (e.g. timber volume growth projections).

The field procedures include initial plot establishment and measurement to establish baseline data, and the periodic re-measurement to measure change.

1.2 How to use this document

This document is used in conjunction with the current VRI ground sampling manual (Version 4.0). It references the manual and identifies required additions to the present VRI system. These additions are highlighted in the text.

Section 2 describes the sample plot configuration. Section 3 describes the procedures for locating and establishing the sample plots and for collecting tree, plant, coarse woody debris and range information. Procedures for plot re-location, re-establishment and re-measurement are also included in Section 3.

2.0 The VRI System of Plots

The VRI data definitions, standards, measurements, and field cards will be used for measuring change. The VRI sample cluster typically includes a central sample point (the Integrated Plot Centre, or IPC), surrounded by four auxiliary points located 50 m at cardinal directions from the IPC. Several types of plots may be referenced to the IPC to estimate current vegetation attributes and their change over time (Table 1). All attributes are attached to the plot center point.

Table 1. VRI system cluster components.

Resource	Sampling method	Plot radius	Units
Trees			
Large trees (>4 cm)	Variable radius plot	-	5
Large Trees (≥4 cm)	(NEW) 400 m^2	11.28 m	1
Small Tree (<4 cm)	19.6 m^2	2.5 m	1
Site Trees	100 m^2	5.64 m	1
Ecology			
Shrubs (foliar cover intersect)	Line intersect (24 m)	-	2
Shrubs (height and % cover)	314 m^2	10 m	1
Herbs, mosses and tree seedlings	100 m^2	5.64 m	1
Succession	1,962.5 m^2	25 m	1
Soil	Soil pit	-	1
Coarse Woody Debris	Line intersect (24 m)	-	2
Range (forbs, graminoids)	0.5 m^2	0.399 m	4

The Ministry of Forests (MOF) added a fixed-area plot to the VRI system. The 400-m^2 plot can be used instead of the variable-radius plot (VRP) for sampling trees 4.0 cm or larger (Figure 1). This plot type will give practitioners more options for collecting change data and non-timber attributes.

The plots will be permanent, inconspicuous, and subject to operational activities. The VRI procedures for marking the plot centres in parks and private land will be used. All trees will be re-locatable (stem mapped, but not tagged) so the diameter and height growth on each tree is known.

The current procedures for locating the plots and taking the various measurements and the additional steps are described below.

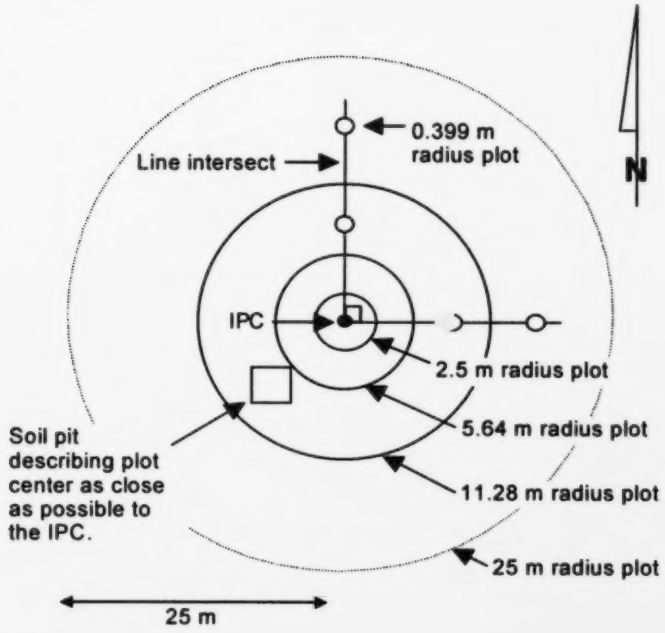

Figure 1. VRI Integrated Plot Centre (with a 11.28-m radius plot).

3.0 Plot Location, Establishment and Measurement

3.1 Locating the Integrated Plot Centre

Introduction

This section outlines the steps for traversing from the tie point to the IPC. The field crew is responsible for selecting suitable tie points, navigating to the reference point and IPC, and recording the information on the field cards. The route must be suitably marked to aid re-visitation to the plot center in the future.

Objectives

The objectives are to:

1. Locate the Integrated Plot Centre in the position indicated on the document photo,
2. Mark and document the cluster location and navigation points to allow for short and long-term sample relocation.

General Procedures

Office Preparation

1. Become familiar with polygon characteristics, IPC, and access prior to field visitation:
   - Identify the location of the IPC on the photo.
   - Identify the location of the IPC on the map.
   - Determine the relative accuracy of the map:photo relationship.
2. Locate a potential tie point and alternatives on the map and photo.

Field Location

1. Locate and confirm a tie point in the field and mark the Tie Point reference.
2. Navigate to the reference point.
3. Ensure you are in the correct ground position as indicated on the photo.
4. Drive the Reference Pin in the ground.
5. Blaze and tag the Reference Tree and measure the bearing and distance to the Reference Pin.
6. Measure the final 15.0 m to the IPC.
7. Drive a pin in the ground to mark the IPC.

The Field Cards needed are:

- Header Card (CH)
- Compass Card (CP)
- Cluster Layout (CL).

Detailed Procedures

Please refer to section 2 of the VRI ground sampling manual (version 4.0).

Additions

1. Record Network Label – the NFI 20 km network label that identifies the point on the network associated with the ground plot - provided by CFS, for provincial level sampling.
2. Record that the measurement is a "Change" sample on the CH card.
3. Marking the IPC. Follow the procedures for establishing "hidden" plots outlined in the 2000 addendum to the VRI ground-sampling manual version 4.0[1]:
   a) Insert the full length of the stake into the ground and place a large iron nail inside the stake. The nail head should be large enough to stop the nail from sliding to the bottom of the stake.
   b) Place a small cairn of rocks around the location of the stake.
   c) Take at least one picture at the reference pin facing toward the IPC.

1. Relocating the IPC during plot re-measurement:
   a) Plan before leaving for the field – review old field cards and photographs.
   b) If the tie point is distinct and the distance from the tie point to the IPC is short, use conventional chaining methods to re-locate the general area for the IPC pin. Use a real-time corrected GPS unit to confirm the location.
   c) If the tie point is indistinct or the distance is long, use real-time corrected GPS to navigate to the plot.
   d) Once in the general area of the IPC, seek the reference tree tag, soil pit and other clues for location of the IPC.
   e) Use metal detector to determine the exact location of the IPC.

3.2 Plot establishment

Introduction

This section outlines the layout of plots and measurement procedures at the IPC (Figure 1).

Objective

The objective is to establish plots for collecting data to meet specific management unit objectives; users can select from the sampling methods listed in Table 1.

General Procedures

1. Confirm that the IPC is in the correct location.
2. Assess safety considerations.
3. Verify plot configuration:
   - Is the plot on the border of the polygon?

[1] RIC. 1999. Vegetation Resources Inventory Addendum to Ground Sampling Procedures, Version 4.0 (provided by Verne Sundstrom, MOF RIB, March 2000).

- Are the Auxiliary Plots within the polygon?

4. Determine and carry out the sequence of activities:
   - Assess the site vegetation and determine the most efficient sequence of measurements to ensure that specific values are not degraded by other activities. For example, plants of interest for forage values may be trampled if tree heights are measured first.
5. Record the Integrated Plot characteristics (project and sample ID, type of plot, etc.).

The Field Cards needed are:

- Header Card (CH)
- Compass Card (CP)
- Cluster Layout (CL).

Detailed Procedures
Please refer to section 3 of the manual

Additions

1. Establish a 11.28 m-radius fixed-area plot at the IPC to measure all trees 4.0 cm+ in diameter.
2. Ignore polygon boundaries; a sample plot may straddle more than one polygon.
3. If a plot straddles polygons, determine and map the distinct polygon boundaries:
   a) Record the distance and bearing from the IPC to the boundary reference points – the points where the polygon boundaries intersect the plot circumference (or line transect) and to an intermediate point.[2]
   b) Sketch a map of the boundaries on the CL card to allow area calculation of the land types sampled on a plot.
   c) If the boundaries have changed significantly since the document photos were taken, use the document photos or the BC Landcover Classification Scheme (BCLCS) to determine the polygon boundaries.
   d) Assign sample trees, plants, portions of transects, etc. to the respective polygons.
1. Re-map the polygon boundaries during re-measurement.

3.3 Tree measurements

Introduction
This section describes procedures for making detailed tree measurements, to estimate tree volume and volume growth, and to assess quality and site potential.

[2] U.S. National Forest Inventory and Monitoring Core Field Guide. Volume 1: field data collection procedures for all plots (draft version 3/99, section 3.0). Source: USDA Forest Service Internet website: http://www.srsfia.usfs.msstate.edu/wo/draft_3_99.htm.

Objectives

The objectives are to:

- Collect attributes to calculate tree and stand volumes,
- Collect site index information,
- Assess forest health and decay.

General Procedures

Tree measurements are conducted in the following steps:

1. Establish 11.28 m radius fixed-area plot layout and identify large trees (4.0cm+) to measure:
   - Identify and record tree attributes.
   - Assess and record wildlife use.
   - Record damage agent and severity code.
   - Identify and record tree loss indicators.
   - Conduct call grading and net factoring.
2. Establish fixed radius plot for small tree and stump data:
   - Classify and tally small trees by species
   - Measure and record stump data.
3. Establish a fixed-radius plot for top height and site tree measurements:
   - Select and record top height tree and random tree data.
4. Determine leading species composition (by basal area) for the sample cluster:
   - Select and record leading species height, age, and growth information for all sample trees.
5. Select and record a second species site tree.

The Field Cards needed are:

- Tree Details (TD)
- Tree Loss Indicators (TL)
- Small Tree, Stump, and Site Tree Data (TS).

Detailed Procedures

Please refer to sections 4, 5 and 6 of the manual.

Additions

1. Do not split plots (refer to section 4.1).
2. Do not mark sample trees – follow the hidden plot procedures.
3. Stem map all trees in the 400 m^2 plot (refer to section 4.6).
4. During re-measurement, select new top height and random trees if previous ones are no longer "suitable".

3.4 Plants, soils and old growth

Introduction

This section describes procedures to collect data to describe the land (soil attributes, erosion), and the vegetation (land cover, succession, biomass and biodiversity).

Objectives

The objectives are to:

1. Collect accurate information about plant species composition,
2. Identify, estimate, and measure selected soil and site features,
3. Determine the successional characteristics of the stand,
4. Classify sample plots using the biogeoclimatic ecosystem classification system, the BCLCS, and to identify the site series.

General Procedures

Collecting ecological measurements involves the following steps:

1. Establish the 10 m fixed-radius plot and the 5.64 m sub-plot:
   a) Describe vegetation in the 5.64 m and 10 m fixed-radius plots before the soil pit is dug and the site is trampled too much.
   b) Describe herb and moss layer, and seedlings in the 5.64 m radius plot, and tree and shrub layers in the 10 m radius plot. The latter plot is also used for site description, and soil and site classification.
1. Record the site and soil description..
2. Interpret the successional characteristics of the stand in the 25 m radius plot.

The Field Cards needed are:

- Ecological Description 1 (EP)
- Ecological Description 2 (ED)
- Tree and Shrub Layers (ET)
- Herb and Moss Layers (EH)
- Succession Interpretations (EO).

Detailed Procedures

Please see section 7 of the manual.

Additions

No soil descriptions will be done during re-measurement unless there are major changes (e.g. site distrubance or flooding).

3.5 Coarse woody debris

Introduction
This section outlines the procedures for establishing the sampling transects, deciding which CWD to measure, and recording the measurements.

Objectives
The objectives are to:

- Accurately determine the gross volume of coarse woody debris by decay class,
- Identify merchantable material and potential removals.

General Procedures
CWD can be measured in the following steps:

1. Set out the 24 m sampling transects.
2. Assess the transect conditions.
3. Measure and record information for the CWD pieces.

The Field Cards needed are:

- Coarse Woody Debris (EW)
- Coarse Woody Debris (EC).

Detailed Procedures
Please see section 8 of the manual.

Addition
1. At re-measurement, use the same transect.

3.6 Range resources

Introduction
This section describes procedures for assessing shrub and herbaceous abundance and biomass, and graminoid biomass.

Objectives
The objectives are to:

1. Provide estimates of forage production of graminoids and forbs by clipping plots.
2. Provide estimates of forage utilization of graminoids and forbs using forage utilization classes.
3. Provide a measurement of shrub abundance by measuring shrub foliar cover.
4. Provide an identification of shrub species composition.

General Procedures

The range resources may be assessed in the following steps:

1. Establish line intercept for shrub measurements.
2. Establish forage sampling micro-plots.
3. Estimate and record forage use.
4. Clip the forbs and graminoids to measure forage abundance.
5. Record shrub species and foliar cover.

The Field Cards needed are:

- Range sampling (RS)
- Range Sampling (RT).

Detailed Procedures

Please refer to section 9 of the manual.

Additions

During re-measurement:

1. Re-establish the line intercept for shrub measurements.
2. Establish new forage sampling micro-plots. Stagger clipped plots along the transect. For example, re-locate the small plots at 5 m and 11 m along the transect line at first re-measurement, at 4 and 10 m at the second re-measurement, and so on.
3. Estimate and record forage use.
4. Clip the forbs and graminoids to measure forage abundance.
5. Record shrub species and foliar cover.